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Changes in Nitrate Concentrations in Spring Waters Due to Mixing of Surface and Ground Water in the Woodville Karst Plain, Northern Florida

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Abstract

Ground water in the Woodville Karst Plain is highly susceptible to contamination as a result of the numerous sinkholes and other karst features that allow for direct interactions with surface water. Since the early 1970's, nitrate-N concentrations have increased from 0.26 to 0.89 mg/L in Wakulla Springs and 0.06 to 0.19 mg/L in Riversink, major ground water discharge locations for the Upper Floridan aquifer. Two methods were used to better understand the hydrochemical response of springs in this area to changes in rainfall/recharge during 2000: (1) in-situ water-quality multi-parameter instruments that logged hourly measurements of specific conductance and temperature were installed in both springs, and (2) water samples were analyzed for chemical and isotopic tracers during baseflow conditions (February) and after a high-rainfall period (October). Following most small rainfall events (2.5 cm or less) during January through July, specific conductance values in Wakulla Springs and Riversink showed little or no change. However, following several large rainfall events in August and September (57 cm total), specific conductance decreased from 310 to 250 uS/cm in Wakulla Springs and from 250 to 60 uS/cm in Riversink. Correspondingly, concentrations of nitrate decreased in both springs, but dissolved organic carbon increased, indicating an increased contribution from surface water. Based on binary mass-balance models, the maximum amount of surface water that mixed with ground water was estimated to be 20% for Wakulla Springs and 95% for Riversink during the high-flow period.